

# Standards of Radioactivity – Product List

- [1]. Delivery of Plutonium-239 products outside the UK is subject to Export Control Regulations.
- [2]. Delivery of Thorium products outside the EU is subject to Export Control Regulations.
- [3]. Delivery of natural Uranium products outside the EU is subject to Export Control Regulations.
- [4]. Delivery of Uranium-232 products may be subject to UK Export Control Regulations.
- [5]. Delivery of Uranium-233 products outside the EU is subject to Export Control Regulations.
- [6]. Delivery of Zirconium-93 products outside of the EU is subject to Export Control Regulations.

Radionuclide	Approximate Activity Concentration	Product Mass	Chemistry	Detected Impurities (Approximate % of Activity Concentration at certificated reference time)	NPL Product Code
<b>Actinium-227</b>	To be confirmed – Please register interest with <a href="mailto:radioactivity@npl.co.uk">radioactivity@npl.co.uk</a> and we will be in contact once the product has been produced.				
<b>Americium-241</b>	10 Bq/g	10 g nominal	0.5 mol dm <sup>-3</sup> nitric acid	None detected	R13-01
	300 Bq/g	10 g nominal		None detected	R13-02
	4 kBq/g	10 g nominal		None detected	R13-03
	100 kBq/g	10 g nominal		None detected	R13-05
<b>Americium-243</b>	1 Bq/g	10 g nominal	1 mol dm <sup>-3</sup> nitric acid	<sup>241</sup> Am < 0.05 %	R18-00
	100 Bq/g	10 g nominal			R18-20
<b>Caesium-137</b>	10 Bq/g	10 g nominal	0.1 mol dm <sup>-3</sup> nitric acid containing 50 µg g <sup>-1</sup> inactive caesium	None detected	R03-01
	100 Bq/g	10 g nominal		None detected	R03-02
	350 kBq/g	1 g or 3 g nominal	0.1 mol dm <sup>-3</sup> hydrochloric acid containing 10 µg g <sup>-1</sup> inactive caesium	None detected	R03-05
<b>Carbon-14</b>	100 Bq/g	10 g nominal	Aqueous sodium carbonate containing 5 mg g <sup>-1</sup> inactive sodium carbonate and 1 mg g <sup>-1</sup> formaldehyde	None detected	R19-02
	2 kBq/g	10 g nominal		None detected	R19-03
<b>Carbon-14 (glucose)</b>	100 Bq/g	10 g nominal	Aqueous D-[1- <sup>14</sup> C]-glucose also containing 1 mg g <sup>-1</sup> inactive glucose and 1 mg g <sup>-1</sup> formaldehyde	None detected	R43-02
	2 kBq/g	10 g nominal		None detected	R43-03
	100 kBq/g	10 g nominal		None detected	R43-05

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Radionuclide	Approximate Activity Concentration	Product Mass	Chemistry	Detected Impurities (Approximate % of Activity Concentration at certificated reference time)	NPL Product Code
<b>Curium-244</b>	To be confirmed – Please register interest with <a href="mailto:radioactivity@npl.co.uk">radioactivity@npl.co.uk</a> and we will be in contact once the product has been produced.				
<b>Iodine-129</b>	100 Bq/g	10 g nominal	0.001 mol dm <sup>-3</sup> sodium hydroxide	None detected	R14-02
	1 kBq/g	10 g nominal		None detected	R14-03
<b>Lead-210</b>	1 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid containing 50 µg g <sup>-1</sup> inactive lead and 50 µg g <sup>-1</sup> inactive bismuth	None detected	R22-00
	40 Bq/g	5 g nominal		None detected	R22-01
	350 Bq/g	10 g nominal		None detected	R22-02
	37 kBq/g	5 g nominal	1 mol dm <sup>-3</sup> nitric acid containing 50 µg g <sup>-1</sup> inactive lead and 50 µg g <sup>-1</sup> inactive bismuth	None detected	R22-03
<b>Nickel-63</b>	2 kBq/g	10 g nominal	0.1 mol dm <sup>-3</sup> hydrochloric acid containing 100 µg g <sup>-1</sup> inactive nickel	None detected	R48-03
<b>Neptunium-237</b>	1 kBq/g	5 g nominal	3 mol dm <sup>-3</sup> nitric acid	<sup>239</sup> Pu/ <sup>240</sup> Pu < 0.01 % <sup>229</sup> Th < 0.01 %	R21-03
	10 kBq/g	3 g nominal			R21-04
<b>Plutonium-236</b>	10 Bq/g	5 g nominal	2 mol dm <sup>-3</sup> nitric acid	None detected	R37-01
<b>Plutonium-238</b>	10 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	None detected	R45-01
	100 Bq/g	10 g nominal		None detected	R45-02
	1 kBq/g	10 g nominal		None detected	R45-03
<b>Plutonium-239</b> <sup>[1]</sup>	50 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	<sup>240</sup> Pu < 0.5 % <sup>241</sup> Pu < 0.2 %	R24-01
	1 kBq/g	10 g nominal			R24-03
<b>Plutonium-240</b>	To be confirmed – Please register interest with <a href="mailto:radioactivity@npl.co.uk">radioactivity@npl.co.uk</a> and we will be in contact once the product has been produced.				
<b>Plutonium-241</b>	10 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	<sup>238</sup> Pu < 0.02 % <sup>239</sup> Pu < 0.01 % <sup>240</sup> Pu < 0.05 % <sup>242</sup> Pu < 6 × 10 <sup>-4</sup> % <sup>244</sup> Pu < 3 × 10 <sup>-9</sup> % <sup>241</sup> Am – Decay product	R35-01
	150 Bq/g	10 g nominal			R35-02
	4 kBq/g	5 g nominal			R35-03
<b>Plutonium-242</b>	1 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	<sup>241</sup> Am < 0.3% <sup>241</sup> Pu < 5 %	R15-00
	12.5 Bq/g	10 g nominal			R15-20

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Polonium-209	To be confirmed – Please register interest with <a href="mailto:radioactivity@npl.co.uk">radioactivity@npl.co.uk</a> and we will be in contact once the product has been produced.				
Protactinium-231	100 Bq/g	5 g nominal	7 mol dm <sup>-3</sup> hydrochloric acid	None detected	R49-02
Radium-226	100 Bq/g	10 g nominal	1 mol dm <sup>-3</sup> hydrochloric acid	None detected	R36-02
	2 kBq/g	10 g nominal		None detected	R36-03
	40 kBq/g	5 g nominal		None detected	R36-04
Radium-228	10 Bq/g	5 g nominal	2 mol dm <sup>-3</sup> nitric acid	<sup>226</sup> Ra < 0.3 %	R42-01
Strontium-90	100 Bq/g	10 g nominal	1 mol dm <sup>-3</sup> nitric acid containing 50 µg g <sup>-1</sup> strontium and 50 µg g <sup>-1</sup> yttrium	None detected	R01-03
	2 kBq/g	10 g nominal		None detected	R01-05
	40 kBq/g	10 g nominal		None detected	R01-04
Technetium-99	100 Bq/g	10 g nominal	0.1 mol dm <sup>-3</sup> ammonium hydroxide	None detected	R11-02
	1 kBq/g	10 g nominal		None detected	R11-03
Thorium-229 <sup>[2]</sup>	1 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid containing 10 µg g <sup>-1</sup> ammonium cerium nitrate	None detected	R26-00
	10 Bq/g	10 g nominal		None detected	R26-01
	100 Bq/g	10 g nominal		None detected	R26-02
Tritium	10 Bq/g	10 g nominal	Tritiated water	None detected	R30-01
	100 Bq/g	10 g nominal		None detected	R30-02
	5 kBq/g	10 g nominal		None detected	R30-04
Tritium (Glucose)	1 kBq/g	10 g nominal	D-[3- <sup>3</sup> H]-glucose containing 1 mg g <sup>-1</sup> inactive glucose and 1mg g <sup>-1</sup> formaldehyde	None detected	R44-03

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Radionuclide	Approximate Activity Concentration	Product Mass	Chemistry	Detected Impurities (Approximate % of Activity Concentration at certificated reference time)	NPL Product Code
Natural Uranium <sup>[3]</sup> Uranium-234 Uranium-238 Uranium-235	100 Bq/g ~50 Bq/g <sup>234</sup> U ~50 Bq/g <sup>238</sup> U ~2.5 Bq/g <sup>235</sup> U	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	None detected	R47-02
	200 Bq/g ~100 Bq/g <sup>234</sup> U ~100 Bq/g <sup>238</sup> U ~5 Bq/g <sup>234</sup> U	10 g nominal		None detected	R47-03
Uranium-232 <sup>[4]</sup>	1 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	None detected	R20-00
	10 Bq/g	10 g nominal		None detected	R20-15
	100 Bq/g	10 g nominal		None detected	R20-02
	5 kBq/g	5 g nominal		None detected	R20-03
Uranium-233 <sup>[5]</sup>	1 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	<sup>229</sup> Th < 0.3 %	R46-00
	10 Bq/g	10 g nominal			R46-01
	100 Bq/g	10 g nominal		<sup>229</sup> Th < 0.2 % <sup>233</sup> U < 0.4 %	R46-02
	1 kBq/g	10 g nominal			R46-03
Uranium-234	10 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	U-232 < 1.5 %	R50-01
	100 Bq/g	10 g nominal			R50-02
Uranium-236	10 Bq/g	10 g nominal	2 mol dm <sup>-3</sup> nitric acid	<sup>235</sup> U < 0.005 %	R41-01
	100 Bq/g	10 g nominal			R41-02
	900 Bq/g	5 g nominal			R41-03
Zirconium-93 <sup>[6]</sup>	To be confirmed – Please register interest with <a href="mailto:radioactivity@npl.co.uk">radioactivity@npl.co.uk</a> and we will be in contact once the product has been produced.				

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## Special Order Products:

Our NPL Mixed Nuclide is produced annually with a 1<sup>st</sup> June reference date. Please place any orders for the following items before the end of March each year to ensure supply. Later requests may be accommodated subject to availability.

Radionuclide	Product description	Chemistry	NPL Product Code
Mixed Radionuclide	10 kBq/g, 1 g nominal	4 mol dm <sup>-3</sup> HCl with 10 µg g <sup>-1</sup> of appropriate carrier elements	R08-02
Mixed Radionuclide	10 kBq/g, 10 g nominal		R08-04
Mixed Nuclide Carrier Solution	500 g nominal		R08-Carrier

3M Filter Mixed Radionuclide****	5-10 kBq total activity	n/a	RR20-3MXX
RASA Filter Mixed Radionuclide****	5-10 kBq total activity		RR20-RSXX
CINDERELLA Filter Mixed Radionuclide****	5-10 kBq total activity		RR20-ARXX
****Optional addition of <sup>210</sup> Pb is available. Please advise when ordering with Customer Services.			